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Immunochromatographic thread-based test platform for diagnosis of infectious diseases

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Immunochromatographic thread-based test platform for diagnosis of infectious diseases

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Abstract

Patterning is an important step in fabrication of multiplexed microfluidic devices. Various approaches including cutting, photolithography, wax-printing, plotting and etching have been developed and tested. Recently, using threads has emerged as a convenient and low-cost approach for fabrication of microfluidic devices. We explored the application of threads in combination with nitrocellulose membrane to fabricate multi-channel immunochromatographic diagnostic devices. Microfluidic channels were made using hydrophilic threads and nitrocellulose membrane strips. Household sewing needle was used to weave hydrophilic thread into desired patterns through a double-sided mounting tape. Glass fibre discs were used as conjugate pads while nitrocellulose membrane was used for immobilisation of capture antibodies. Patterned threads were linked to nitrocellulose membrane strips by overlapping so that reagents flowing through threads were eventually transferred to the membrane. The design was tested using IgG, H. pylori and Hepatitis B surface antigen. Continuous flow was observed from hydrophilic threads to the nitrocellulose membrane, and a positive signal was visualised on the membrane within 5 min of sample application. The observed limit of detection ranged between 30 and 300 ng/ml for H. pylori and Hepatitis B, respectively. Using thread and tape offers a promising alternative for patterning of simple, low-cost multiplexed microfluidic diagnostic devices with potential point-of-care applications in resource-limited settings.

Keywords

Immunochromatographic; Thread-based diagnostics; Infectious diseases; Multiplex microfluidic devices; Point-of-care; Low-cost diagnostics